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ABSTRACT

Curricula that are related to the specific task requirements of an occupation can be developed using task analysis. The development of task-related curricula should follow these steps: (1) complete a pretask analysis to develop a brief description of the job and to gather data related to the amount of supervision required, the number of coworkers involved, and the perceived difficulty of the task; (b) complete the task description; (c) analyze the task description; (d) determine curricula and curricular units; and (e) develop instructional units. The definition of the task should make provisions for listing the equipment, materials, and tools to be used and the external conditions affecting performance of the entire task. Definitions should also list the stages of performance of the task and the various elements within each stage--an element being the basic skill level above that of fine motor skills. This task description is then analyzed for the requisite skills and knowledge, after which tasks can be organized for presentation to the student. To avoid repetition of skills and knowledge, similar tasks should be grouped, and the elements of tasks should be categorized according to their stages (preparation, execution, evaluation, and termination) to determine similarities of elements across tasks. In this manner, similar skills can be taught once. (HMD)

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EDUCATIONAL PROJECTS, INC.
Pittsburgh, Pennsylvania

Allied Health Professions Project

THE DEVELOPMENT OF JOB-RELATED CURRICULA USING TASK ANALYSIS

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THE DEVELOPMENT OF JOB-RELATED CURRICULA USING TASK ANALYSIS

Introduction

"Career Education" is the by-word for education today. With this emphasis, students must be prepared by the educational system to enter the world of work, adequately trained to perform satisfactorily with no (or minimal) additional training being required. If this is to be the case, then it follows that a curriculum must be job related, i.e., it must impart to the student those skills and knowledge which are required for adequate performance in the student's desired field of work. But, the problem is how to determine those skills and knowledge which a student must possess to perform adequately in a particular occupational field. If career education is to be a reliable alternative, this question must be answered. And, even if the skills and knowledge are determined, a second question must also be answered--how can the necessary skills and knowledge be imparted to the student in the most efficient manner?

The following discussion attempts to provide a possible solution to these questions through the use of task analysis procedures. Task analysis is presented here not as the only solution to the problem, rather, as a method which appears to provide a possible solution.

What is Task Analysis

Every occupation can be thought of as being composed of a set of tasks which are performed. The occupation in question may consist of only one task or it may consist of many tasks which

may or may not be related in some logical manner.

For the purposes of this discussion, a task will not be strictly defined. It can be thought of as being composed of a series of steps (or elements) which result in a single usable output (e.g., "Perform cardiopulmonary resuscitation with the use of life support equipment" or "Refill oxygen tanks with compressed oxygen"). The reader who is interested in a precise definition is referred to the EPI Allied Health Profession Project Interim Report, June 1973.

Pre-Task Analysis

Before actually performing a detailed task analysis, a few steps should be considered which would help to make the task analysis a little less frustrating.

Try to determine the general limits of the job, i.e.; attempt to define the job briefly by describing the kinds of activities a worker has to perform on his or her job. This can be accomplished by:

A. locating current job descriptions;

B. locating the job in the Dictionary of Occupational Titles (Department of Labor 1972,); and,

C. consulting with experts and/or incumbents.

This brief description might be formated following the sentence structure suggested by the United States Department of Labor (1972) or by Barlow, et al., (1971); e.g., "Operates coal dryer."

In order to perform task analysis on a single job or job family, it is necessary to determine the tasks which make up the job or job family. This determination can be made by observing performers on the job, interviewing incumbents or consulting with experts. The objective of this first phase is to obtain task statements which indicate the work activities which are required on the job. These task statements may really be groups of tasks, single tasks or elements of tasks. At this stage, it is not too

important that a strict task construction be involved. The task statements can then be arranged into a check list. This checklist can be administered to workers to determine which tasks they perform and at what frequency (Barlow, et al., 1968). Other data can be collected such as:

A. the amount of supervision the performer receives from supervisors;

B. the number of co-workers involved, if any;

C. where the performer learned to perform the task; and,

D. the perceived difficulty of the task.

The check list can be completed:

A. by the performer; or,

B. by an independent observer who observes and interviews the performer.

The purpose of this pre-task analysis phase is to determine the general limits of the job. Additional data is also available on the relative importance of the tasks to the job, based upon the frequency of performance. This phase provides useful information for the task analysis phase.

An example of such a check list is given in Exhibit 1. This check list was used to obtain task performance data from ambulance service providers in the Commonwealth of Pennsylvania.

EMERGENCY MEDICAL TECHNICIAN

INSTRUCTIONS: Read each task and circle the appropriate number to show your answer in each category.

	FREQUENCY: How often do you perform this task?					SUPERVISION: Is another individual usually involved?			SUPERVISION: How much supervision received?			DIFFICULTY: How difficult is this task?			TRAINING: How were skills and knowledge received?			
	Several Times a Day	Once a Day or Several Times a Week	Once a Week or Several Times a Month	Once a Month or less	Never	You Assist	You are Assisted	Equal Involvement	Close Supervision	General Direction	No Supervision	Easy	Moderate	Difficult	General Education	On-the-Training	Both	Experience
101 Operate a bag-valve mask unit to perform intermittent positive pressure ventilation (IPPV)	1	2	3	4	5	1	2	3	1	2	3	1	2	3	1	2	3	4
102 Use a bag-valve mask unit to perform IPPV	1	2	3	4	5	1	2	3	1	2	3	1	2	3	1	2	3	4
103 Perform mouth-to-mouth method of IPPV	1	2	3	4	5	1	2	3	1	2	3	1	2	3	1	2	3	4
104 Perform mouth-to-nose method of IPPV	1	2	3	4	5	1	2	3	1	2	3	1	2	3	1	2	3	4
105 Use a sphygmomanometer (blood pressure cuff) and stethoscope to obtain a patient's blood pressure	1	2	3	4	5	1	2	3	1	2	3	1	2	3	1	2	3	4
106 Place fingers on patient's wrist to count radial pulse	1	2	3	4	5	1	2	3	1	2	3	1	2	3	1	2	3	4
107 Assemble intravenous fluid administration equipment	1	2	3	4	5	1	2	3	1	2	3	1	2	3	1	2	3	4
108 Perform a venipuncture to administer intravenous fluids	1	2	3	4	5	1	2	3	1	2	3	1	2	3	1	2	3	4
109 Use a syringe to administer intravenous medications into the I.V. tubing	1	2	3	4	5	1	2	3	1	2	3	1	2	3	1	2	3	4
110 Use a syringe to administer intravenous medications	1	2	3	4	5	1	2	3	1	2	3	1	2	3	1	2	3	4

Task Analysis

Completion of the above procedures provides the basis from which a detailed task analysis can begin. Unfortunately, there is no such thing as "the" task analysis methodology (Educational Projects, Inc., 1973); e.g., some authors label the two steps outlined in the section Pre-Task Analysis as a task analysis methodology. However, it seems apparent that such a limited task analysis is, in most circumstances, not sufficient to generate enough data or information to construct a job-related curriculum (i.e., it does not generate information on how, why or when certain work activities are done).

Many task analysis methodologies exist. It is not within the scope of this paper to review them all; rather it is the intent in this section to briefly explain a task analysis methodology and to point out how this methodology might be used to construct a job-related curriculum.

Task analysis can be explained by viewing it as a two-stage operation: the first being task description; and second being the analysis of the description, which consists of determining any information which might be useful in developing training materials (Miller, 1966). In order to avoid confusion, these two stages will be discussed separately.

Task Description

The steps in constructing a task description given in the following:

1. A task should be defined. The definition is not a description--it is the format that is used to describe any given task.

Several task definitions already exist (e.g., see Klaus, Gosnell, Reilly and Taylor, 1968; Lanham, Herschelmann, Weber and Cook, 1970; United States Department of Labor, 1972a; Gilpatrick, 1972; Educational Projects, Incorporated, 1972).

At the basic minimum (for purposes of developing a curriculum), the task definition should:

A. clearly indicate the limits or the floor and ceiling of the task (e.g., when does the task begin and end, and exactly what does the task encompass?). It should be pointed out that the sentence structure description discussed above does not enable one to clarify the limits;

B. clearly specify what a unit of work must contain before it can legitimately be called a task.

For the purposes of developing curricula, it appears that the definition should make provisions for distinctly describing the work in some detail (however, not in as much detail perhaps as is required for a time-study description). In order to obtain such detail and to structure limits, it has been found useful to

define a task so that it contains:

A. stages of production, e.g., a preparation stage, execution stage, follow-up (or evaluation) stage and a termination stage (Klaus, et al., 1968; Educational Projects, Incorporated, 1972; Lanham et al., 1972); and,

B. elements for each stage--elements have generally been defined as "The smallest steps into which it is practical to subdivide any work activity without analyzing the separate motions, movements and mental processes involved." (United States Department of Labor, 1965, p.6)--that is, the elements should contain as much detail as possible, but generally should avoid a description of fine motor skills.

In addition, the definition should make provisions for listing:

A. the equipment, materials, machines and tools used during production for each element (United States Department of Labor, 1972);

B. the external conditions affecting the performance of the entire task or any element within the task; such as, temperatures, noise levels, and other environmental stimuli (United States Department of Labor, 1972);

and,

C. any assumptions made in the performance of the element (Klaus, et al., 1968); e.g., it might be assumed that material is at hand and that the performer does not have to obtain the material from storage.

2. The definition and its provisions should be applied to the work statements used to construct the check list (see Pre-Task Analysis). That is, those work statements should be rewritten so that they conform to the definition that is being used. It should be noted that not all statements need to be exploded to conform to the definition; e.g., if the frequency information collected from the administration of the check list indicates that a specific kind of task is performed infrequently, it may be decided that the statement should not be exploded.

The work statement can be exploded to conform to the definition by:

A. actually observing performers and recording the task, its stages and the elements within each stage according to the definition; and,

B. interviewing incumbents or their supervisors or an expert to record the task so that it conforms to the definition.

3. The suggested structure for developing a task description involves the following steps:

A. A system flow and/or a series of sub-system flows are developed (see Exhibit 2 for an example related to emergency prehospital care). These flow diagrams can serve as advanced organizers which assist in identification of the tasks and their relation to one another.

B. The tasks which have been identified in the systems flow are diagrammed in detail using the same flow charting techniques (see Exhibit 3 for an example of a partial task flow). Of particular interest in the resulting flow diagram are the major procedural steps which must be performed, decision points in the process, alternate steps which can be taken and steps which are conditionally repeated.

C. Using the flow diagram as a structural model of the task, a task description is written (see Exhibit 4 for an example of a section of a task description). The description contains:

--assumptions concerning the conditions under which the task is

EXHIBIT 2
SYSTEMS FLOW

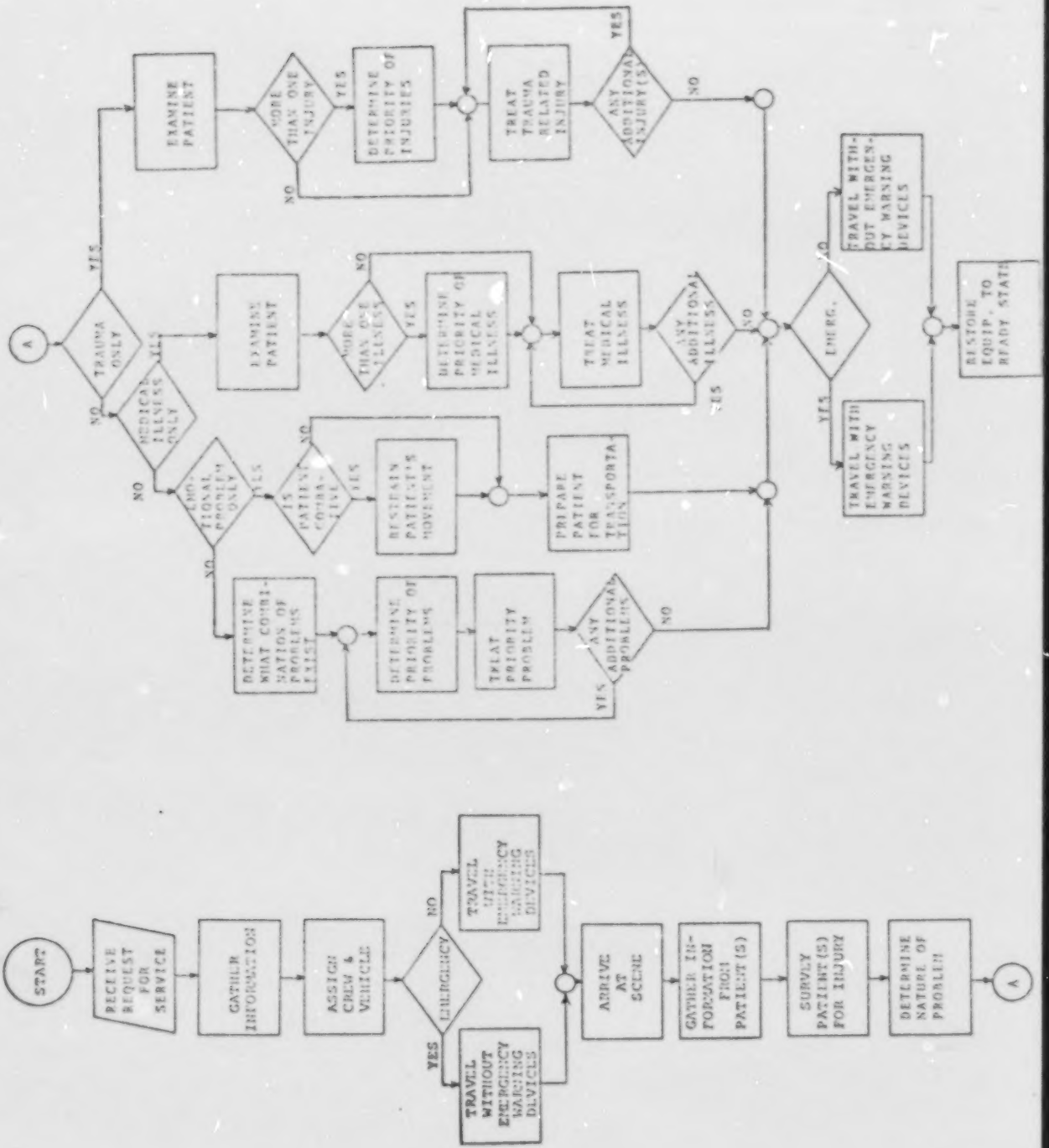
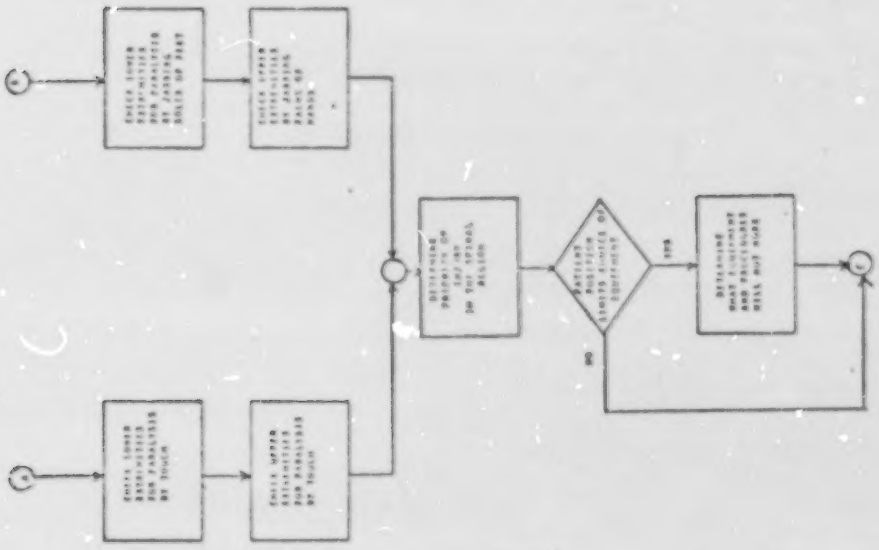


Exhibit 3
Partial Task Flow
Task - Treat Spinal Injury



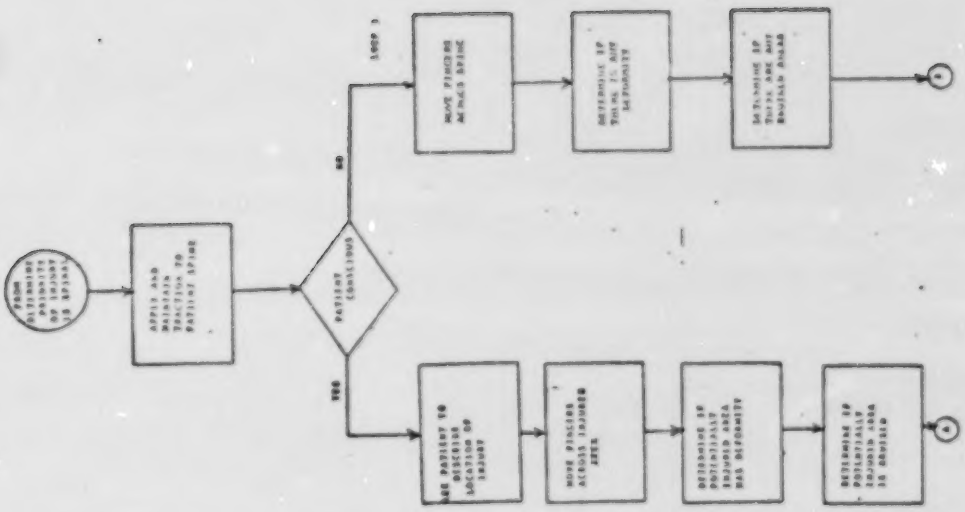


Exhibit 4
Partial Task Description
Task - Treat Spinal Injury

ELEMENTS	EXPLANATIONS
	Assumes that it has been determined that there is a possibility of a spinal injury.
1. Apply and maintain traction to the patient's spine by grasping the patient's head with the fingers at the base of the skull and the thumbs under the chin while exerting a steady pull upwards and away from the patients shoulders.	The contact points on the patient's skull and mandible should receive equal pressure and the traction should be applied smoothly. Once traction is applied, it should not be released or varied until the patient's spine is completely immobilized or it has been determined that no injury exists. (Note 1)
2. Determine if patient is conscious and alert enough to talk to EMT concerning area of injury and/or pain by asking questions. (If patient can not communicate, Loop 1)	Questions asked can serve a dual purpose by: a. determining level of communicative ability; b. gathering further information concerning history and mechanisms of injury. (Note 2)
3. Ask patient which area of the spine is possibly injured.	If the patient does not indicate any pain or potential symptoms of a spine injury, the patient should still be treated as if there is a spine injury.
4. Ask patient to describe the location of any pain, tenderness or discomfort.	
5. Determine if there is any increase or decrease in pain upon movement by observing patient movement.	The patient should not be asked to move but if movement occurs, observe patient for increase or decrease in pain. Any further movement of the patient may result in additional complications of the injury. Assumes that patient is in a position which permits access to injured area.
6. Move fingers across injured area to determine if there is any increase in pain upon touch, if there are any deformities along the spinal column and if there are any cuts or bruises along the spinal column.	Pressure exerted by the fingers should be light enough that the pressure does not further aggrivate the injury which may be present. At any indication of increased pain, finger pressure should be released immediately. (Note 3)

Exhibit 4--Continued
Partial Task Description
Task - Treat Spinal Injury
LOOP 1

ELEMENTS	EXPLANATION
	Assumes that patient cannot communicate well enough to assist performer in the location of the specific location of the injury to the spine.
1. Move fingers along spine to determine if there are any deformities, bruises and/or cuts which may indicate specific location of an injury to the spine.	Assumes that the patient is in a position which permits access to the spine. In treating a patient who cannot communicate, this procedure may be the best to determine the location of injury.
2. Check for paralysis in lower extremities by lightly jabbing the soles of the feet or the ankle with a pointed object (e.g., pencil point, or pin), and observing for a reaction.	If the spinal cord is functioning properly, the muscles of the feet will flex in reaction to the jab received in the ankle or sole of the foot.
3. Check for paralysis in upper extremities by lightly jabbing the palms of the hands with a pointed object (e.g., pencil point or pin), and observing for a reaction.	If the spinal cord is functioning properly, the muscles of the hand will flex in reaction to the jab received in the palm of the hand.

performed;

--a detailed description of the elements (procedural steps) which are involved, ordered by stages (preparation, execution, evaluation, termination);

--explanations of elements, where required, which describe any assumptions or special conditions which must be noted in the performance of the element;

--notes detailing additional information concerning the performance of an element or group of elements including such things as alternate equipment and procedural steps;

--repeated procedural steps or logical groups of procedural steps which are performed only under certain conditions (loops), (Klaus, et al., 1968); and,

--equipment and supplies which are required for performance of the task.

Analysis of Task Description

Once the task has been described, it is ready to be analyzed. But what is it analyzed for? This, of course, depends upon the purpose of the task analysis. If one is interested in developing a job description, the analysis might be different from that which is required to determine the existence of a career lattice or to develop qualification standards. In the first case, little analysis beyond the task description is required. In the case of the determination of a career lattice, the analysis is of tasks from specific jobs which may form this lattice. The purpose of this analysis is to determine similar skills and knowledge requirements and levels of these required by each job.

For the purpose of this discussion (i.e., the development of job related curricula) the task is analyzed for the skills and knowledge that are required in its performance. However, the task is not "actually" analyzed for the skills and knowledge themselves--it is analyzed for "cues" (indicators) which might determine the skills and knowledge that are used (Miller, 1963). Although this distinction may not appear important, it clarifies the problem and helps to avoid confusion. But what kind of cues does one look for?

Unfortunately, not everyone agrees which cues are important. To a large extent, the cues for which the task description is examined depend upon the definition of skills and knowledge that is used (i.e., the definition of skills and knowledge helps define what kind of cues are important). For example, Gilpatrick (1972) has theoretically and operationally defined skills and

knowledge. The operational definition consists of Thurstone-type rating scales; in order to determine the "appropriate" rating, guidelines (cues) were constructed.

It is suggested that, for the purpose of developing job-related curricula, the following cues are important:

1. Critical errors; e.g., in order to develop curricula and to determine the required skills and knowledge, it is desirable to locate, in the task description, areas where errors in performance are "likely" to occur. The "likelihood" can be determined empirically (Lanham, et al., 1971; Klaus, et al., 1968) or by intuition on the part of an experienced performer. Locating the errors helps to build the training materials (i.e. avoidance of the common errors is a sound teaching principle). In addition, where common errors in performance are located--error recovery procedures should be enumerated within the training program.

2. Critical but unsuspected conditions; e.g., when taking an oral temperature--suppose the thermometer breaks in the patient's mouth. If critical but unsuspected conditions are found, the task description should be rewritten to accommodate them. The elements performed under such conditions are usually a "break" from routine, thus, it might be advisable to present such elements as a loop in the routine or description, i.e., a recycling process.

3. Critical criteria or performance tolerance levels(specification of acceptable performance levels); e.g., performing intermittent positive pressure ventilation 12 to 15 times per minute.

4. Alternative steps; e.g., elements or sets of elements which are used interchangeably in the performance of the task. These alternative steps may result from a difference of philosophy or opinion as to how a situation is to be handled. Although these may be a method which is accepted by a majority, other procedures which find support should be enumerated.

5. Alternative materials, supplies and/or equipment used in performing the task.

6. Procedures or elements which may have to be repeated several times (loops).

7. Procedural steps which indicate a need for interpersonal relations; i.e., human interaction techniques, methods of communication and critical errors which may result.

Identification of Skills and Knowledge

Upon identification of the cues, the task descriptions may have to be rewritten. The task description and cues can then be used to determine the necessary skills and knowledge.

Unfortunately, the procedures to go from the cues and descriptions to skills and knowledge is not "clear-cut." A review

of literature reveals that these procedures are almost nonexistent, or at least "fuzzy." However, there appears to be at least two possible approaches:

1. Somehow change the task descriptions and cues to behavioral objectives.

2. Predetermine the skills and knowledge and "rate" the task or part of the task for the level of the required skill and knowledge.

Either alternative seems to present problems for the practitioner: the first approach may result in a tendency to simply turn the work statement (whether they be elements, stages or entire tasks) into a behavioral objective, without much thought about the underlying skills and knowledge; the second approach is not clear as to what the ratings provide in terms of building a training package. Since the literature is confusing and vague, the following is offered:

1. A definition of skills and knowledge is required. The literature offers many alternatives. However, some of the suggested definitions are not practical. Gilpatrick (1972) provides a set of definitions which serve as a useful distinction for instructional purposes. Gilpatrick (1972) defines skills as the application of knowledge (a display of action); knowledge as the knowing how or why something works. The critical distinction is that skill can be acquired only through practice, while knowledge can be acquired

through didactic means. This distinction is useful when constructing a set of training materials--it means that the training materials will require a didactic section and a practice section. The didactic section presents the underlying knowledge needed to display the action and where the skill section presents an opportunity to try the action and apply the knowledge. However, this distinction provides little practical advice in identifying the specific skills and knowledge required.

If it is assumed that every work element involves a skill (i.e., every work element requires some action to be performed such as making a decision, performing a psychomotor operation, reading, writing, communicating, etc.) then it should be possible to examine the skill (the display of action) for the knowledge that is required in order to display the action. To illustrate this, suppose the action is reading a blood pressure taken with a sphygmomanometer: the skills include attachment of cuff, location of pulse, operation of bulb and reading the pressure guage; the knowledge would be anything that would answer the question, what do you need to know in order to take a blood pressure. For example, a performer would need to know:

--how to obtain pulse for systolic (high) and diastolic (low) pressures;

--why blood pressure reading is important (e.g., indicator of shock, hemorrhage);

--how to read the pressure guage (i.e., interpret the markings);

--what tolerance levels exist;

--when to read and record the blood pressure; and,

--where to place the stethoscope to obtain pulse.

Notice that knowledge includes the what, where, when, how and why of the action. Thus, it seems the "best" way to identify the knowledge underlying a skill is to ask the questions what, when, where, how and why for an element or group of elements.

2. Once the definition has been established, the task descriptions should be reviewed and the skills should be identified (generally one for each work element) and the knowledge underlying the skill or action should be noted; i.e., for each element there should exist one skill statement (which can be the element itself) and a set of knowledge statements accompanying the skill.

Each element in each task, should be analyzed in the above manner. Upon completion of this activity, the skills and knowledge necessary for performance of the

task will be identified.

It is important to note that special care should be taken when attempting to determine the skills and knowledge for those elements which have critical errors. In those areas where critical errors occur, special emphasis in training should be placed in order that the trainee can be taught to avoid these errors. In addition, recovery procedures must be enumerated.

The Determination of Curricula and Curricular Units

Once skills and knowledge have been defined and identified, they have to be organized for presentation to the students. This organizational process should not be confused with the development of a method for presentation. The purpose of the organizational process is to develop the order of presentation and as a result the curricula to be covered. The following is a suggestion for organizing the skills and knowledge. For the purposes of this discussion, it is assumed:

1. that there exists one occupational title of interest;

2. that there exist more than one task for a given occupational title; and,

3. that there exists a complete description and analysis of the tasks including knowledge statements, critical errors, etc.

It should be pointed out that the skills and knowledge as defined (the skill being an element and the knowledge being the what, when, where, why and how qualifiers to the element) are already organized by the task itself; i.e., they should be written into the description itself.

But the organization of skills and knowledge within a task is not efficient or practical when given a set of tasks to teach. If only one task were of interest, that task would be presented the way it is described. However, when dealing with more than one

task, it may be possible to group tasks in such a way that instruction can be branched (i.e., a group of tasks may require the same set of skills and knowledge). Such branching would decrease the instructional time as opposed to teaching each task (set of skills and knowledge) separately. Thus, the following steps are suggested to group tasks (skills and knowledge).

1. Suppose there exists 100 tasks for a given occupational title, then it might be possible to form 10 groups of tasks; where each of the 10 groups contains tasks which are basically similar (i.e., generally require the same set of skills and knowledge). For example, in considering a training course for an ambulance attendant, the first grouping might consist of tasks related to dispatch, travel to and from the scene, primary life support, medical emergencies, central nervous system trauma, administrative procedures, etc.

2. Within each group it should be possible to perform the following steps:

   A. The tasks can be sorted into smaller groups by examining each stage separately but successively; i.e., take the tasks in Group 1 and form another group of tasks by examining their preparation stages for similarities; take that set and subdivide it into a smaller set by grouping those tasks which have similar execution stages and continue the process until the termination stage is reached, or the

point where subdivision is no longer possible (see Illustration 1).

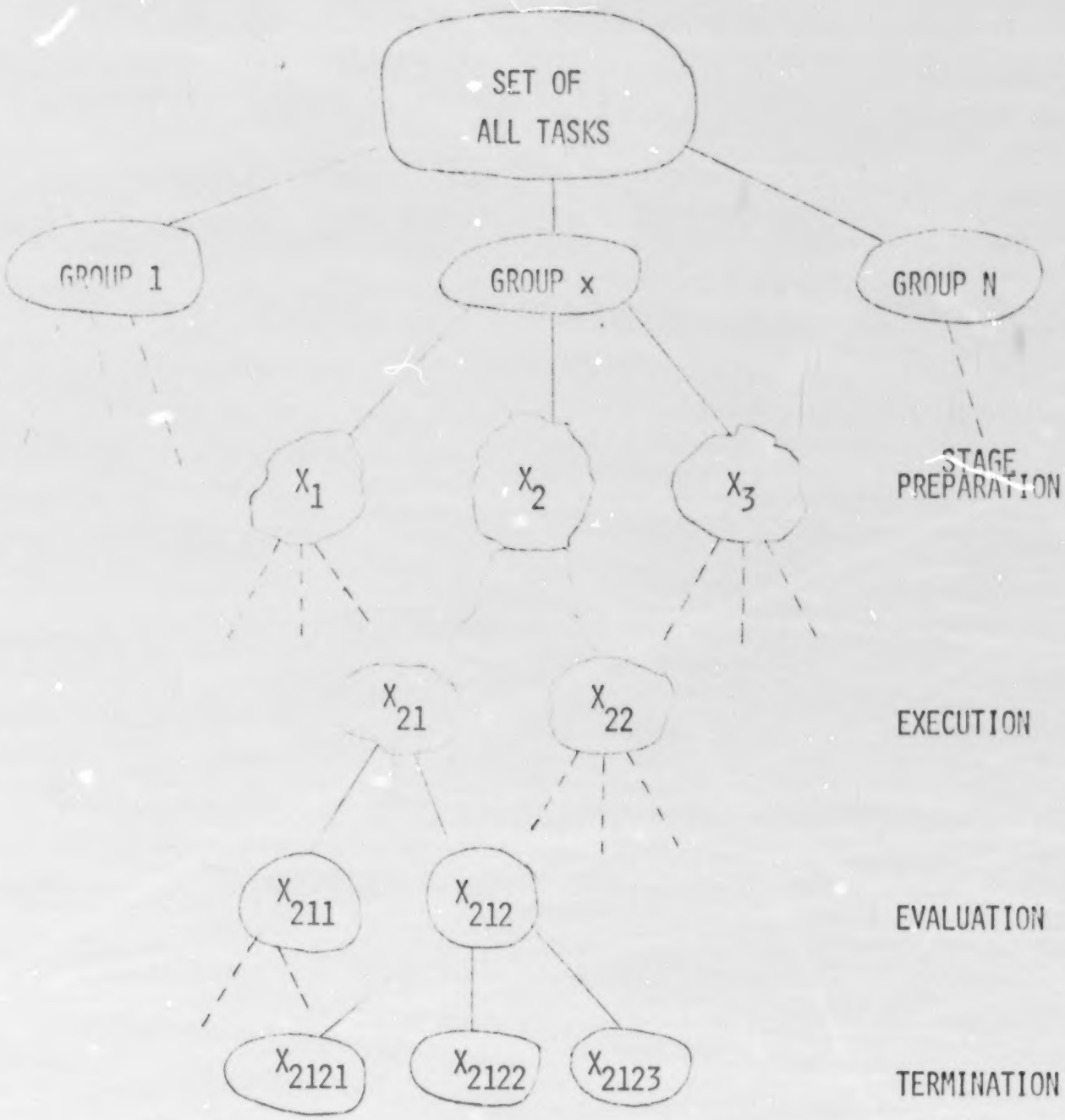
It should be noted that the grouping process, although based upon a decision rule, might often be arbitrary (i.e., what constitutes similarity or difference?). This condition should not be too disturbing since to a large extent any grouping would be arbitrary. In addition, this sorting is only an intermediate step which makes the number of tasks in any group manageable. It is anticipated that in most instances it will not be necessary to go to the termination stage.

B. At the last level, begin to make comparisons (e.g., suppose grouping X(2122) - Illustration 1 - contains two tasks, then these two tasks should be compared for identical work elements in each stage). The comparison at this point should be minimal (i.e., the grouping process is designed to minimize differences). Minimizing the differences will allow duplication in teaching to be minimized and parts of tasks will not have to be taught repeatedly.

3. For each set of comparisons that is made:

A. determine if the tasks can be combined by

ILLUSTRATION 1



inserting a loop; and,

B. examine the compared tasks and decide upon a convenient instructional unit. The size of the instructional unit will vary, it may be as large as all of the tasks in the final grouping or as small as a common element within each task. The size of the instructional unit is determined by the ease of presentation of the material. It is anticipated that each unit will contain a set of elements smaller than a stage, but this is not a restriction.

At this point a curriculum can be constructed using the first grouping as the topical organizer and the final grouping or sub-grouping unit as the basis for development of instructional units.

A Task-Oriented Curriculum

It should be pointed out that the curriculum developed using this method is essentially a task-oriented one, because it teaches the skills and knowledge which are required to perform the specific tasks involved in a job. In addition, the curriculum units are organized in such a way as to relate specifically to the actual tasks. The purpose of such an organization for curriculum is based upon the following:

A. By limiting the training received to only the skill and knowledge required to perform

the job, the student is not faced with sorting out applicable training from that which serves as only background and enrichment.

B. By teaching the student the applicable skill and knowledge in conjunction with the specific task an immediate frame of reference exists for the student.

C. By using this method, the student can be prepared in the most efficient manner to do a specific job.

The above is not to say that the student is being taught only to perform the task. The instruction given is merely organized around the task. The student is given the necessary background knowledge to achieve the skill which he must demonstrate in performing the task.

An argument which might be put forth against a task oriented curriculum is that such a curriculum does not provide the student with career advancement possibilities. This is not really an issue because the scope of the tasks covered by the curriculum are the limiting factor as to the possible career advancement education received by the student. It is not the procedure which is restrictive, it is the choice of tasks which encompass the job which limits the scope of the training. Thus, if it is desired that a training program be designed to train nurses with the possibility for advancement into administrative positions, the curriculum is based upon tasks required of a nurse and tasks

required of a supervisory nurse. Such a curriculum should be flexible enough to allow a student the option of preparing for nursing only or taking the entire training program. In addition, such a program should allow a student with demonstrated competence in the area of nursing to proceed to the management level.

As another example of the above, consider a training program for the nursing profession. The first component of the program can include tasks which are performed by the nurses aide; the second component tasks which a licensed practical nurse performs and the third component tasks which a nurse performs. Thus, students can enter or exit the training program based upon the students prior training or desired occupational aspirations, respectively. In such a program, a licensed practical nurse can enter a registered nursing program with advanced standing as opposed to having to enter the registered nursing program for the total program length.

A second argument, that the student will only be trained in methods currently being used and will require retraining if methods change, can be also be dispelled. Most changes in methods and procedures are based upon currently existing methods. Thus, for the most part, skills and knowledge learned will be transferrable. On the other hand, if the method should be radically changed, the training program can anticipate such a change before it occurs, since fundamental changes usually do not occur immediately.

The Development of Instructional Units

After the tasks have been grouped, the problem becomes one of developing the instructional units. These units are described based upon the information obtained from the task analysis. The unit description contains:

A. a didactic presentation of the knowledge required to perform the task(s) or sub-grouping of elements;

B. a series of practical exercises to impart the skills required to perform the task(s) or sub-groups of elements;

C. a presentation of critical errors and critical occurrances and their related avoidance and recovery procedures;

D. relevant task descriptions;

E. behavorial objectives which are written in such a way as to cover the

- procedure or procedures to be used
- related knowledge
- critical errors and recovery procedures
- critical occurrences and recovery procedures

- alternative steps;

F. related reading assignments;

G. suggested teaching aids such as overlays, films, scenarios and discussion topics; and,

H. pre- and post-test items for the unit.

The results of the task analysis provides information as to the knowledge which should be presented in the didactic session. These results also provide the information concerning the critical errors and critical occurrences which should be covered in the training. The task(s) or sub-group of elements upon which the unit is based provide the basis for the skill session where the student obtains the necessary psychomotor skills and applies the knowledge gained in performing the task. Behavioral objectives, pre- and post-test items are derived from the skills and knowledge requirements of the task.

It should be noted that task analysis does not provide information as to the method of imparting the skills and knowledge to the student. This problem is left to the educator. The only constraint as to presentation is the requirement that a skill session be provided in order that the student obtain practice in performing the task(s) or sub-groups of elements.

It is suggested that the training include practice sessions involving more than one related unit (if such exist). These sessions will allow the student to practice skills in such a manner that the transition and ordering of tasks or sub-groups of

elements are smoothly obtained. This smooth transition becomes important when the student enters his chosen occupation and must perform multiple tasks in succession.

A possible method for obtaining the realistic practice in groups of tasks is to use simulation. Real work situations can be simulated in the classroom or laboratory. These simulations can introduce such things as critical occurrences and time constraints to the student. For example, a simulation of the arrival, triage and treatment of a patient suffering from cardiac arrest can be beneficial to the nurse or ambulance attendant. Since irreversible brain damage occurs in four to six minutes after arrest, the time in which the tasks involved are performed is of great importance. The simulation technique provides a method for training the student to react to such situations.

The introduction of computer simulation, with pre-programmed scenarios, can provide a mechanism whereby both training and testing for competency can be accomplished. Such a simulation could provide for individualized instruction and testing where the computer monitors the student's progress. Such a system is well within the realm of technical possibility and would provide a valuable instructional tool if based upon the anaysis of tasks required for the given occupation.

Some Final Comments

The preceding discussion provides a method for translating job requirements, in terms of tasks, into instructional units and curricula. It might be argued that this method is satisfactory for training in those occupations where knowledge and skill are limited to prescribed procedures involving mechanistic processes and that in areas of "affective" behavior (e.g., interpersonal relationships) this methodology does not provide useful information.

This argument, though it may be valid, cannot be considered as a proven fact at this point, since task analysis has not been applied to occupations involving a large percentage of nonprescribed tasks. However, given the fact that "affective" behaviors occur only as a part of the tasks which must be performed on the job, it is possible that task analysis may provide the key to solving the problem of training in these areas.

It should be noted that perhaps non-prescribed is not appropriately used here. This indicates that procedures do not exist. It may be more to the point to say that the results of prescribed affective behaviors have not been established by research at this time. There are, however, many situations which have general agreement as to acceptable procedures (because of differing philosophies there may be more than one acceptable procedure) which can be used to produce the desired results. Thus, the differing philosophies result in alternate by acceptable, prescribed procedures rather than non-prescribed

procedures. It is likely that few situations exists which do not have acceptable (though not researched) procedures which are recommended for use.

As with any skill or knowledge, the problem of career education is to determine what is required by the job and how to impart this to be student. "Affective" behavior skills, such as interpersonal relations, are different in that prescribed procedures do not exist, the number of input variables are large and that they are much broader in applicability. Thus, it is difficult to determine how much training a student should receive in these skills. Again, task analysis appears to provide a solution to this problem. It requires, when the task is analyzed, that those elements where such nonprescribed "affective" behaviors as inter-personal relationships exist that they be noted. The possible alternatives which are reasonable as procedures for these "affective" behaviors can be listed as a part of the task description. The test for reasonableness of procedures serves to limit the number of input variables handled and thus, the possible alternate methods so as to producea manageable situation. These "affective" behaviors then are handled in the same manner as critical errors, procedural steps, tolerance levels, etc.; (i.e., they are included as elements, explanation and notes within the task description and as a result, as part of the skills and knowledge within the resulting instructional units). As with other skills and knowledge, the "affective" behavior relevant to the job are then those which are imparted to the student.

The above procedure appears to be a reasonable one for use in developing job related training in "affective" behaviors. It is at least a novel method for approaching these subjects and given its reasonableness this method should be attempted. The "elusive" characteristic of "affective" behaviors have made their identification and analysis a difficult and perhaps impossible task to date. Task analysis may provide a key where by the previously insurmountable may be described and analyzed.

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